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TECHNICAL PROGRESS REPORT

MOLTEN-CAUSTIC-LEACHING SYSTEM INTEGRATION PROJECT
TRW APPLIED TECHNOLOGY DIVISION

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TECHNICAL PROGRESS REPORT

The overall strategy for the project Tasks 1 through 6 was to allow for the earliest startup of the Task 6 integrated operations with a minimum of up front costs attributed to plant modifications. The plan was to implement only those modifications that were required in order that the plant could be operated in an integrated continuous manner and defer other modifications that would improve plant operation until needed. The necessary modifications were those affecting the operation of the vacuum filters and the evaporator which were critical for integrated operation. Those modifications were completed and, after a series of off-line tests were performed to verify the operation of the vacuum filters and the evaporator, a week of continuous around-the-clock shakedown test operations was conducted starting on June 3, 1991.

Problems with filtration during the June 1991 test run (high level of coal fines) indicated that the Pittsburgh coal in our inventory might be weathered. Coal sample analysis showed an increase in sulfate sulfur and a decrease in heating value, also indicative of weathering. Although TRW had more than enough coal in inventory to complete the planned test matrix, TRW obtained fresh coal to avoid the problems associated with weathering and disposed of the weathered coal in inventory. TRW also disposed of the remaining liquids and coal/caustic solids from the previous program.

Repairs to centrifuges and plant modifications required to resume test operations were made. Additional off-line tests of plant component equipment were performed, and a second week of continuous around-the-clock integrated test operations was conducted starting on May 14, 1992 using fresh coal. An integrated unit-by-unit test of the entire MCL wash train was conducted in June 1992, and in July 1992 a series of MCL coal and water separation tests were performed in a 9-inch solid bowl centrifuge to obtain scaleup data.

TASK 4 MCL READINESS EVALUATION AND DECISION POINT

Topical Report Preparation

A Topical Report covering the work conducted under Tasks 1, 2 and 3 was prepared during this reporting period and is currently under management review. The Topical Report covers maintenance and refurbishment of the MCL equipment (Task 1), design modifications for integrated test circuit operations (Task 2), and MCL circuit component testing (Task 3).

TASK 6 CONTINUOUS OPERATION OF THE INTEGRATED MCL SYSTEM

Michael Nowak of the DOE visited the site in August and met with program personnel to discuss the current status of the program including the topical reports.

Unit-by-Unit Wash Train Test Results

An integrated unit-by-unit test of the entire MCL wash train was conducted on June 24-25, 1992 using the ~600 pounds of kiln discharge material collected during the May integrated test operations. An acid wash was not utilized

during this wash train test. Although the acid wash train equipment (consisting of three wash/centrifuge separation stages) was used for additional stages of water washing, it appears that the additional stages are not needed. Deionized water similar in purity to that normally obtained from the evaporation section was used during this wash train test. During the last two days of the May integrated test operations, the concept of operating without an acid wash was first demonstrated. However, the operating records of the May test indicate that the wash water in use at that time had been contaminated with caustic (caused by the carryover of caustic in the recycled overhead condensate from the caustic evaporator during a minor evaporator upset). The June wash train test duplicated the operating conditions used during the last two days of the May integrated test but eliminated the effect of wash water contamination on the coal product quality.

The results of the washing tests are summarized in Table 1. As can be seen, the wash train configuration and wash water quality had very little effect on the coal product sulfur content - the kiln conditions being a constant for these tests. A low sulfur coal product was produced in each of these tests. However, the ash content of the product coal produced was affected by the wash train configuration and the quality of the wash water used. Using an acid wash, a product of low (0.49%) ash content was produced. However, if only a water wash is used, the ash content of the product coal increases to 2.70% (or 4.23% when caustic contaminated wash water was used). The coal product samples were washed two more times with deionized water in the laboratory to see if there was a potential for further ash reduction with additional stages of water washing. The ash value of the product coal was reduced by the additional washing from 2.70% to 2.36% (and from 4.23% to 3.58% when caustic contaminated wash water had been used in the plant).

During this reporting period chemical analyses of samples from the May around-the-clock long duration integrated test and the June unit-by-unit integrated wash train test were completed. Product coal samples were sent out for ultimate analysis of the ash, and laboratory work on trace sodium in the product coal was performed. This data is being analyzed and will be reported in future reports.

Nine-Inch Centrifuge Tests

In July a series of MCL coal and water separation tests were performed in a 9-inch solid bowl centrifuge. The objective of these tests was to generate scaleup data on centrifuge performance with MCL coal in a machine that is more typical dimensionally (L/D ratio) of commercial equipment than the 6-inch solid bowl centrifuges used to date in the MCL integrated test facility. The tests conducted to date with the 6-inch machines have not yielded scaleup capacity data for the centrifuges due to the limited pumping range of the centrifuge feed and centrate pumps in the MCL wash train. The tests with the 9-inch centrifuge were conducted over a range of feed water to coal ratios including an operating point close to that expected in a full scale MCL plant.

The attached Table 2 summarizes the centrifuge test results. At centrifuge rates of 2.5 and 5 GPM, we were able to obtain a cake product with a moisture content of 40 to 44%. The solids carryover to the centrate in the 9-inch machine was <0.1% at a centrifuge feed rate of 2.5 GPM. Solids carryover to

TABLE 1
MCL WASH TRAIN CONFIGURATION EFFECT ON
PRODUCT COAL SULFUR/ASH

	WT% S	WT% ASH	
<u>COAL FEED</u>	~2.3	~7.9	
<u>COAL PRODUCT</u>			
• <u>May 14-21 Test:</u>			
w/ Acid Wash, pH=1-2			
5/18 06:00	0.43	0.49	
No Acid Wash (Note 1)			
5/19 20:00	0.45	4.37	} Avg.
5/21 01:00	0.27	3.84	
5/21 04:10	0.52	4.47	
			4.23%
After 2 Additional Lab DI Water Washes			
5/19 20:00	NA	3.71	} Avg.
5/21 01:00	NA	3.13	
5/21 04:10	NA	3.91	
			3.58%
• <u>June 24-25 Test:</u>			
No Acid Wash (Note 2)			
6/25 01:00	0.28	2.27	} Avg.
6/25 05:00	0.36	2.84	
6/25 09:00	0.40	2.99	
			2.70%
After 2 Additional Lab DI Water Washes			
6/25 01:00	NA	2.14	} Avg.
6/25 05:00	NA	2.32	
6/25 09:00	NA	2.63	
			2.36%

NOTE 1: Acid wash train equipment used for additional stages of water washing. Water used for washing during this time period was contaminated with caustic.

NOTE 2: Acid wash train equipment used for additional stages of water washing. Clean deionized water was used for washing during this time period.

TABLE 2
MCL COAL AND WATER
9-INCH SOLID BOWL CENTRIFUGE SEPARATOR PERFORMANCE RESULTS

NOMINAL FEED WATER:COAL RATIO	10:1	10:1	5:1	5:1
GPM FEED	2.5	5.0	2.5	5.0
% MOISTURE IN CENTRIFUGE CAKE	40%	43%	44%	44%
% SOLIDS IN CENTRATE	<0.1%	1%	<0.1%	2%

the centrate increased to 1% at a centrifuge feed rate of 5 GPM and a feed water:coal ratio of 10:1, and to 2% at a feed rate of 5 GPM and a feed water:coal ratio of 5:1.

Plant Securing Operations

Long term securing operations in the plant were completed during July. The kiln internal thermocouple was repaired. Weekly preventative maintenance was performed on all rotating equipment during August and September.

TASK 7 COAL PRODUCT HANDLING/WASTE DISPOSAL

Liquid Waste Disposal

One truckload, approximately 5000 gallons, of liquid waste was hauled away in July by Rollins, the site contractor for waste disposal.

MCL Solid Waste Disposal

The solid waste material was repackaged in July in preparation for off-site disposal. Rollins visited the site in July to inspect and sample various waste drums. Fifty-nine drums of solid waste material were hauled away by Rollins in August for off-site disposal. The waste disposal task for the program is now complete.

TASK 9 PROJECT MANAGEMENT AND CONTROL

A no cost contract extension to January 1, 1993 was granted.

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